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**CONVERTING THE IDEP MASTER FILE REPORTS FORMAT**

by  
Claude E. Martin

June 1966

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6 June 1966

RSIC-567

## **CONVERTING THE IDEP MASTER FILE REPORTS FORMAT**

by  
Claude E. Martin

EDIS Task II  
Director of Army Technical Information  
Office of Chief, Research and Development  
Department of the Army

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## **ABSTRACT**

This report presents some of the problems that were encountered in converting the Interservice Data Exchange Program master film strip file to 16 mm roll film, and offers methods for solving them. It points out the lack of equipment and quality control techniques for producing film copies from hard copy documents. The situations that cause poor quality film when reproducing by the diazzo method are discussed. In addition, situations that cause heat splices to break are mentioned.

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## Section I. INTRODUCTION

This report contains the result of work performed under Task II of the Engineering Data and Information System (EDIS) project. The objective of EDIS Task II was to develop format and procedures for the acquisition, storage, retrieval, and dissemination of engineering data and information, to define the interfaces with other information systems, to specify the interface requirements, and to develop the necessary and applicable standards appropriate to engineering data and information handling.

In the course of the investigation and evaluation of existing engineering data and information files, it was apparent that a standardized format was needed for input-stored records and for original records of engineering data and information obtained within the Research and Development Test and Evaluation cycle. The Interservice Data Exchange Program (IDEP) master film file was selected to be standardized in a format that is in accordance with format types recommended in Technical Logistics Data Information Committee Study No. 10.

The project involved approximately six months of effort by a contractor and approximately one month of in-house effort by the Redstone Scientific Information Center. Essentially, the work consisted of examining the files, converting to roll film, testing alternate forms, and interfacing with other existing scientific and technical information system formats.

The effort to convert the original IDEP master film strip file from various formats to 16 mm cartridge roll film and standard size (105 x 148 mm) microfiche (with some type of indexing for retrieval) was accomplished in three phases:

- 1) Phase one was a trial run. Due to the nature of the work, a trial run was required to determine if acceptable quality could be produced. The contractor was required to produce four reels of 16 mm roll film containing approximately 12,000 images of the IDEP master film strip file. Laboratory tests on the four reels proved the feasibility of changing the IDEP master file format to a format that would interface with the other existing scientific and technical information system formats. The interfacing requirements were 16 mm microfilm cartridges and standard size (105 x 148 mm) microfiche.
- 2) Phase two produced a master copy. Since the work performed in phase one was acceptable to the government, the contractor

was authorized to proceed with the work, producing a master copy of the IDEP information on 16 mm roll film, with an option to convert the 16 mm roll film to microfiche.

- 3) Phase three was a continuing effort in examining problems, making trial conversions, investigating indexing and interfacing methods, developing cost estimates, and testing user reactions to alternate forms of data and information. A single format of 16 mm cartridge roll film with a block style alphanumeric accession number spliced before each report contained on 100 feet of film was selected. The selection of a single format of 16 mm microfilm cartridge roll film resulted, not because of the method of conversion, but because of the condition of the film in the IDEP master film strip files. The master files contained film ranging in generations from first silver through fourth diazo with densities from 0.068 to 1.96, some in aperture cards, some on 35 mm film, some taped to IBM cards, some glued to IBM cards, torn film, bent film, and some filmed at a different reduction ratio.

A block style, five digit, alphanumeric accession number which could be used on present day equipment (the Termatrix or equivalent) was spliced before each report to aid in indexing and searching.

## Section II. PROBLEMS IN THE ARMY INTERSERVICE DATA EXCHANGE PROGRAM

The main problems were concerned with the handling of the film strips, the amount of interfacing, and filing space.

The film strips were damaged by scratches and fingerprints because of the manual handling that was required to cut, splice, and tape the film strips to the top of summary cards. In addition, the amount of interfacing needed and the space required to maintain the file were a problem because of the 13-digit alphanumeric filing number used. This created a misfiling problem to the extent that in many cases reports were considered lost and additional hard copies were requested for microfilming. Also, the format of the stored information was a problem to the user since there was no standard equipment to read the film strips with ease.

The 13-digit filing number was tailored for the particular needs of IDEP participants. An example follows:

Example: 152.30.40.60-B8-02

<u>152</u>	<u>30.40.60</u>	<u>-B8</u>	<u>-02</u>
Major classification identifying part/com- ponent.	Subclassification identifying type, material, con- struction, etc.	Contractor or other source originating the report.	Sequence of report. (Same title by same con- tractor.)

The above example identifies the report as the second report by Avco Manufacturing Corporation on capacitors, fixed, film metalized, hermetically sealed, plug-in type.

The IDEP storage and retrieval system is one of its own; therefore, interfacing with other information systems that are trying to standardize into a single format was almost impossible.

In order to eliminate some of the above problems, the project was approached in the following manner: the files were examined, a master was made up on 16 mm film, and additional copies were made for distribution among the Air Force, Navy, and Army participants.

### Section III. EXAMINATION OF THE MASTER FILM STRIP FILE

Film strips of reports were pulled from the files at random and examined for generation, resolution, gross density, fingerprints, and scratches. The result of the examination proved the feasibility of converting the total IDEP files to 16 mm film. Based on 12,000 images selected at random, it was believed that approximately 99 percent of the film could be converted into readable images by contact printing of the film by the diazo method. The 12,000 random images consisted of three basic types of film: first generation silver, second generation diazo, and third generation diazo. In creating the four diazo film rolls, the contractor elected to utilize the second generation diazo film rolls because the emulsion is on the face of the film. In doing this, the subsequent contact prints would be right-reading and universally accepted in most readers or reader-printers. This meant that the first generation silver and third generation diazo film in the file would have to be reversed (emulsion side placed on front of the film) in order to make the contact prints. On the basis of the 12,000 random images, it is assumed that approximately 20 percent of the files would require such reversing.

In order to produce the best quality of film from the file, each report was examined for generation, emulsion, resolution, and gross density.

#### 1. Generation

The generation of each film strip had to be determined. Generation is a measure of the remoteness of the copy from the original document. The first picture taken of the document is termed first generation microfilm. Copies made from the first generation are termed second generation, and copies from the second generation are termed third generation, etc. Each time there is a generation change there is an emulsion change. This is one of the reasons why it is important, when creating a master file, that only first generation film be included, because there are losses of 8 to 12 percent per generation in duplicating, even if the sensitivity of the film matches the spectral emission of the light source used for exposure in the duplicating system.

Examination of the IDEP master film strip files revealed the following stages of generation on file:

- 1) First generation silver film (emulsion on reverse side).
- 2) Second generation diazo film (emulsion on face side).
- 3) Third generation diazo film (emulsion on reverse side).
- 4) Fourth generation diazo film (emulsion on face side).

Second generation diazo film and fourth generation diazo films could be exposed directly to the master roll. But first generation silver film and third generation diazo films had to go through an intermediate copy before exposure to the master roll, because the master roll requires that the emulsion must always be on the same side throughout the roll. The quality of the intermediate copy was important also because additional copies would be made from the master rolls. When contact printing, the emulsion side of the film to be duplicated is placed into firm contact with the sensitized side of the unexposed film. In other words, the films were placed emulsion to emulsion.

## 2. Emulsion

The emulsion side of each film strip was determined. (Emulsion is a photographic material in which light sensitive materials are suspended.) There are different methods to determine the emulsion side, some are listed below:

- 1) By scratching the exposed part of the film.
- 2) By determining the glossy surface of the film.
- 3) By contact-printing one side and then the other and comparing the quality of the products.
- 4) By following the ASA standard for determining microfiche.

Comparison of contact prints was the method selected to determine the emulsion side. It was felt that some of the information would be lost by the scratch method, and the film was in such condition that the glossy side could not be determined.

Once the emulsion side was determined, the exposing light source was positioned on the same side as the film which was being duplicated, so that the light could pass through to the unexposed film in proportion to the densities of the film through which it passes. Contact printing requires that the film being duplicated and the copy film remain in positive contact during exposure. Separation or any slippage of either film will deteriorate the quality. Extreme care must be taken when using a drum roll-to-roll printer, because the two films are a slightly different distance from the center, a condition that may easily cause slippage. When exposure is made frame-by-frame or by a group of

frames, the pressure pads must be so designed and contact made in such a way that no air pockets or deformations may occur which could interfere with the positive and complete contact of the film.

### **3. Resolution**

The original film strips were examined to determine the resolution. (Resolution is the ability to render visible fine detail of an object, i. e. , a measure of the sharpness of an image.) Resolution in processed microfilm is a function of film emulsion, exposure, camera lens, camera adjustment, camera vibration, and film processing. It is measured by filming a resolution chart and then examining the filmed resolution test chart under a microscope to determine the smallest pattern in which lines can be distinguished both horizontally and vertically. The resolution chart generally used in microfilm is the National Bureau of Standards Microcopy Resolution Chart No. 1010. There are two methods to determine the resolution using the microcopy resolution chart. These two methods are called the pattern-recognition method and the line-count method. The pattern recognition method requires only that a pattern can be seen, thus leaving little doubt that quality control can be maintained. The line-count method requires that one be able to see and count five separate lines with certainty. This method does have a degree of quality control and eliminates the possibility of being misled by spurious resolution. Spurious resolution is a false indication of resolution which may result from an out-of-focus condition. If spurious resolution is suspected, the number of lines in a pattern may be counted. If there should be five lines, and less than five can be counted, the resolution is spurious.

In checking the film strip files, none of the film checked had the standard microfilm resolution chart, but by viewing the film through a microscope it was determined that the files contained film that ranges from good to extremely poor resolution. In some instances the images were unreadable.

### **4. Density**

The density of film is the light-absorbing quality of a photographic image (degree of opacity for film and blackness for prints), usually expressed as the logarithm of the opacity. There are several specific types of density values for a photograph which may be expressed, but diffuse transmission density is generally of interest for prints. Diffuse transmission density is the common logarithm of the ratio of the radiant flux striking the sample perpendicular to the surface to the

radiant flux transmitted by the sample when all the transmitted flux is collected and equally evaluated. (All the emerging rays have the same effect on the receiver regardless of the angle at which they emerge.) There are several factors which affect the light transmission of film: base material, dye, and emulsion. The total density that can occur is a summation of the individual densities, which in some cases will create problems in obtaining adequate exposures.

By using a densitometer it was determined that the density of the films in the IDEP master film file ranged from 0.068 to 1.96. In several cases, the density of the printed copy film was better than the original because the density was improved by either under or over exposure during copying.

#### Section IV. PREPARATION OF THE MASTER FILE ROLL FILM

In order to have quality control when contact printing several generations, the following factors must be considered.

- 1) The range of line densities.
- 2) The gama of the copy film.
- 3) The spectral transmission characteristics of the original and the spectral sensitivity of the copy film.
- 4) The spectral emission of the light source.
- 5) The nature of the light rays used for exposure.
- 6) The method of maintaining contact between the two films.
- 7) The exposure time.
- 8) The development method.

With the above factors in mind, one of the problems encountered in carrying out phase three was that of cleaning the film strips because those film strips that were taped to cards required extreme use of chemicals to clean. Another problem occurred because it was difficult to determine the emulsion side and film category before exposure. A third problem occurred because some of the images were recorded on 35 mm film instead of 16 mm film.

Due to the lack of quality control in creating the original master film, the exposure to the master roll required evaluation of each image in the files. This evaluation was through trial and error, because no known existing equipment is available for foolproof evaluation. In some cases as many as 10 exposures were needed to obtain acceptable copies.

The film was in very poor condition and the wide range of categories required that the master roll be produced on a contact strip printer in order to obtain a uniform roll.

The block style alphanumeric accession number in addition to the film strip and the IDEP generic code numbers was added to each report for indexing and for retrieval. The numbers were spliced into the master rolls keeping the emulsion sides the same. A splice is a joint made by cementing or welding (heat splicing) two pieces of film or paper together so they will function as a single piece when passing through a camera, processing machine, projector, or other apparatus. Cemented splices are called lap splices since one piece overlaps the other. Most welds are called butt splices since the two pieces are butted together without any overlap.

A butt-weld splicer was used to produce a plastic splice in a matter of seconds by a combination of electrically produced heat and precise pressure applied within a controlled time cycle. Several factors are involved in attaining satisfactory results: (1) an adequately controlled time cycle, (2) correct current adjustment, (3) variations in the line voltage, (4) a proper cooling cycle, (5) environmental conditions, and (6) the quality of the emulsion and the tolerance of the acetate of the film. If a splice is unsatisfactory because of burned emulsion or brittle acetate, it snaps when bent sharply. The unsatisfactory splice can be eliminated by using a trial and error method until the correct setting is obtained for the amount of heat and timing cycle.

## **Section V. DUPLICATION OF THE MASTER FILE ROLL FILM**

There were 177 one hundred foot rolls of 16 mm film produced for the master file roll film which had to be duplicated for the Air Force, Navy, and all of the Army Contractor Data Coordinators.

Several rolls were duplicated on a strip contact printer and distributed for comments. The comments were favorable and some groups requested a complete set.

Due to the time involved in duplicating by the strip printer, it was decided to use a roll-to-roll drum printer. Ten of the rolls were spliced together to be duplicated, but because of the small bends and as many as 80 heat splices per roll, and the amount of tension needed to make firm contact, the roll often broke when sufficient pressure was applied to produce usable copies. Several methods were used to stop the breakage without results until the copy roll was sandwiched between the duplicating film and a roll of stock film. This method stopped the breakage, but the reproduced quality that resulted was too poor for distribution.

## Section VI. CONCLUSIONS AND RECOMMENDATIONS

The IDEP master film strip file was converted to 16 mm roll film and arranged by the IDEP generic code number sequence. This sequence mixed the old and new reports together making the quality of the film range from good to extremely poor. It also caused the many problems in converting the files, and in trying to produce a uniform roll from which additional copies could be made for the IDEP users.

The loss caused by changing from one generation to another (about 8 to 12 percent) made the total quality of some rolls too poor for use. Because of the numbers, the type of splicer, density, resolution, and generation in each roll of film, neither firm contact nor the proper amount of tension could be maintained to produce quality film.

There was too much guesswork in trying to determine the right exposures. Had there been a microline densitometer to correlate the existing exposure devices and to compare with the background densities, a lot of the guesswork would have been eliminated. In addition, it would also have provided the quality control needed on uncontrolled existing microimages.

In too many cases the original documents sent to the IDEP offices were not suitable for microfilming. Some were blue type on blue paper, some were poor carbon copies, and some were on onion skin paper. The following recommendations are made:

- 1) The original documents sent to the IDEP offices should be of microfilming quality where the resolution and density are of adequate quality to produce readable copies.
- 2) The effort to convert the IDEP files from strip film to microfilm rolls should be started over. As many hard copy documents as possible should be obtained and they should be microfilmed before contact printing. The contact printing should be done only when the hard copy has been destroyed.
- 3) Each IDEP office should send in all hard copy reports on hand, and the material from each office should be filmed together starting with reports dated 1 January 1965 and going back to the start of the IDEP program.

In the above recommendation items two and three were incorporated and have proven to be satisfactory. The satisfactory copies of roll film are being furnished to the Army IDEP participants. The process is slow and only the oldest reports in the files are hard to read, because of the number of generations and the condition of the film.

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